A new instrument for time-resolved measurement of HO_2 radicals

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Introduction

The objective of the paper is to characterise a new detection system for the HO_2 radical with a particular focus on the yield of HO_2 as a product in the reaction of OH radicals with various substrates. To obtain the HO_2 yield of the $OH + RH/O_2 \rightarrow H_2O + HO_2$ + carbonyl reaction, we need the relationship between OH and HO_2 and this is obtained from the following calibration reaction $OH + H_2O_2 \rightarrow HO_2 + H_2O$ where there is a 1:1 relationship between OH and HO_2.

There are two sets of data; firstly a study of the $OH + CH_3OH/O_2 \rightarrow H_2O + HO_2 +$ HCHO, where the yield of HO_2 at sufficiently high $[O_2]$ is well known and is 100%. The second set of data is on the $OH + n\text{-}C_4H_9OH/O_2 \rightarrow H_2O + HO_2 + n\text{-}C_3H_7CHO$ reaction where the HO_2 yield is less well characterised.

For each reaction a series of back-to-back experiments are carried out, firstly with OH reacting with the calibrant or substrate monitoring OH and secondly with NO present in the detector converting HO_2 into OH. The net HO_2 signal is obtained by subtracting the two traces as exemplified by Fig 4 in the paper. The HO_2 yield is then obtained by comparing the HO_2 levels when H_2O_2 is the substrate (100%) with CH_3OH or $n\text{-}C_4H_9OH$ being the substrate.

File Descriptions

In each zip file (Methanol or Butanol) there is one or more excel spread sheets titled **month-year-OH-CH3OH.xlsx** or **month-year-OH-C4H9OH.xlsx** which contain all the conditions for each experimental trace (e.g. concentration of substrate, whether NO is present or not) and then a series of txt files which contain the raw traces (OH signal as a function of time) and are titled **year-month-date-RunX-Kinetics.txt**.